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NAVY UNDERWATER SOUND REFERENCE LAB ORLANDO FL
CALIBRATION OF SCANNING SONAR TRANSDUCER TR-117A/SQS-4 MOD 3 SE--ETC(U)
OCT 57

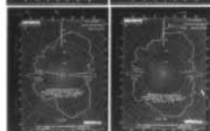
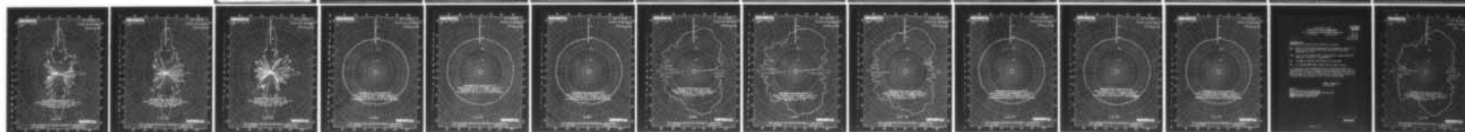
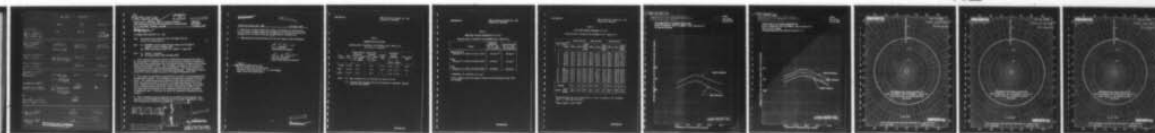
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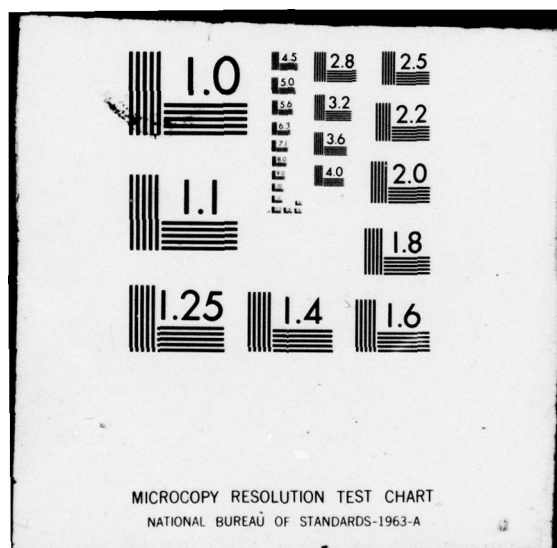
USRL-CALIBRATION-1465

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Calibration Report No. 1465
Project No. 1995

1. MOST Project

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⑥
Calibration of
Sounding Beam Transducer
TR-117A/SMB-4 Mod 3
Serial E-8.

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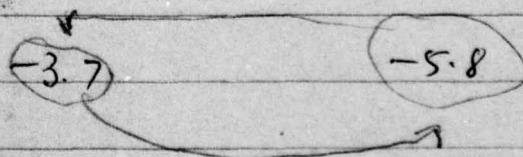
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AN/SQS -4 Mod 3

	Spec	GE	Saugame
Transmitting Power response (db re 1 μ bar (per watt at 1 yd))	76	75.9	77.8 (calculated)
Receiving Response db re 1 volt per microbar Search section	-80 ± 1.5 original -83 ± 1.5 modified	-80.7 ± 1.5 (Average of 8)	-81.6 ± 1.4 (Average of 4)
Receiving Response UMCC Section	-85 ± 1.5 original -90 ± 1.5 modified	-86.5 ± 1.7	-86.8 ± 2
Receiving Response LMCC Section	"	-83.8 ± 1.6	-84.3 ± 1.4
Impedance, Search (Phase Angle Variations)	$\pm 2^\circ$ of the mean original $\pm 2^\circ$ std deviation (modified)	$\pm 1.2^\circ$	$\pm 1.1^\circ$ approx
Impedance UMCC			
Impedance LMCC (Phase angle variations)	$\pm 5^\circ$ of the mean (original) $\pm 5^\circ$ std deviation (modified)	$\pm 4.9^\circ$ $\pm 4.9^\circ$ $\pm 4.9^\circ$	*
Impedance LMCC (Phase angle variations)	"	-3.7 +2.0 ± 3.7	

Efficiency (db)
Search



Efficiency (db)
UMCC

-8.8

-9.0

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TECH REP #23

128-8

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EMR/hs
RP-1805
3 October 1957

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CALIBRATION REPORT No. 1465

Subj: Scanning sonar transducer TR-117A/SQS-4 Mod 3,
serial X-2; calibration of

Ref: (a) BUSHIPS Contract Specification Sonar Set AN/SQS-4,
SHIPS-S-1972 of 16 May 1955
(b) USRL Calibration Report No. 1456 of 21 Aug 1957

Encl: (1) Tables 1 through 3
(2) Drawings USRL 19393 through 19409

1. This report provides the results of calibration measurements made on the second Mod 3 transducer sent to this activity by the Harris Transducer Corporation and manufactured for the General Electric Company which holds basic contract NObsr-71072. The first Mod 3 transducer was returned to the Harris Transducer Corporation uncalibrated. The serial number X-2 was assigned by the USRL for identification purposes. Calibration measurements were made during the period 19 through 27 September 1957.

2. The results of calibration measurements on serial X-2 are presented in enclosures (1) and (2). The transducer has generally acceptable characteristics. The transmitting power response of the search section is 0.1 db below the specified value of 76 db re 1 microbar squared per watt at one yard. Patterns in the vertical plane were taken at $\theta = 60$ deg, or through a point midway between staves No. 8 and 9, because the location of the lift-ring holes in the bottom of the transducer did not permit orientation at transducer zero. This does not affect the transducer evaluation in any respect.

3. The nonscanning vertical patterns for the MCC sections appear to be equivalent to those shown in reference (b) for the Mod 4 transducer, which was accepted as a satisfactory transducer. → next page

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Calibration Report No. 1465

3 October 1957

4. Impedance measurements were made on 16 staves for each section, and the spread of phase angle was ± 2 degrees for the search section and ± 5 degrees for the MCC sections, as specified in reference (a).
5. Measurements with the delay line were not made on this transducer.

E. A. Barnes

E. A. BARNES
Measurements Branch

Eva M. Raybun

EVA M. RAYBUN
Head, Data Reduction Branch

Copy to:

→ BUSHIPS (848)(1)(with encl)

Harris Transd Corp (1)(with encl)

Gen Elec (1)(with encl)(Attn: K. C. Greenhalgh)

USRL Code 210 (1)(with encl)

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USRL Calibration Report No. 1465
Project No. RP-1805C

Table 1

TRANSMITTING EFFICIENCY

Scanning Sonar Transducer TR-117A/SQS-4 Mod 3 Serial X-2
All Staves in Parallel

Trans Section	Freq (kc)	Trans Current Response (db re 1 μ bar per ampere at 1 meter)	Trans Power Response (db re 1 μ bar ² per watt at 1 yard)	Direct Index (db)	Equivalent Series Impedance		Efficiency (db)
					R (ohms)	X (ohms)	
Search	12.00	73.8	75.9	10.0	0.74	1.73	-5.8
UMCC	12.00	67.9	67.4	14.7	1.34	-0.77	-9.0
LMCC	12.00	67.9	67.2	—	1.40	-0.35	—

Notes: (1) Peak response for all sections was about 11.85 kc

(2) Transmitting responses have been corrected to represent average value for any azimuth

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Table 2

FREE-FIELD VOLTAGE SENSITIVITY AT 12 KC

Scanning Sonar Transducer TR-117A/SQS-4 Mod 3 Serial X-2

Staves	Measured Sensitivity (db re 1 volt per microbar)	Specification ^a (db re 1 volt per microbar)
Search Section Average of 8 staves (drawing 19394)	-80.7±0.5 ^b	-80.0±1.5
UMCC Average of 8 staves (drawing 19394)	-86.5±0.7	-85.0±1.5
LMCC Average of 8 staves (drawing 19394)	-83.8±0.6	-85.0±1.5

^a Reference (f), section 3.4.1.14.2

^b The ± number shows the range of variation of individual staves from the average.

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USRL Calibration Report No. 1465
Project No. RP-1805C

Table 3

EQUIVALENT SERIES IMPEDANCE AT 12 KC

Scanning Sonar Transducer TR-117A/SQS-4 Mod 3 Serial X-2

Stave No.	Stave (a) Position (deg)	Search Section			UMCC Section			LMCC Section		
		R (ohms)	X (ohms)	Phase Angle (deg) ^(b)	R (ohms)	X (ohms)	Phase Angle (deg)	R (ohms)	X (ohms)	Phase Angle (deg)
1	3.75	37.4	73.3	63.0	79.4	-8.7	-6.3	98.6	-18.7	-10.7
2	11.25	38.5	71.9	61.8	73.5	-10.3	-8.0	95.2	-19.0	-11.3
3	18.75	36.2	73.1	63.7	78.4	-11.8	-8.6	91.8	-20.2	-12.4
4	26.25	37.4	72.4	62.7	74.7	-16.4	-12.4	90.3	-12.6	-7.9
5	33.75	35.5	74.8	64.6	81.2	-13.8	-9.6	95.0	-15.2	-9.1
6	41.25	36.3	72.6	63.4	80.0	-12.8	-9.1	91.1	-16.4	-10.2
7	48.75	36.0	71.3	63.2	78.5	-6.3	-4.6	87.6	-21.2	-13.6
8	56.25	36.4	71.5	63.0	77.2	-13.9	-10.2	98.8	-15.8	-9.1
41	303.75	35.0	71.8	64.0	78.5	-8.6	-6.2	94.1	-19.8	-11.9
42	311.25	37.3	74.5	63.4	74.5	-9.7	-7.4	94.8	-19.8	-11.8
43	318.75	35.3	71.2	63.6	79.9	-11.2	-8.0	81.9	-19.7	-13.5
44	326.25	35.5	73.0	64.1	83.2	-12.5	-8.5	73.5	-17.6	-13.5
45	333.75	36.0	73.3	63.8	77.5	-13.2	-9.7	96.0	-22.1	-13.0
46	341.25	36.1	70.1	62.8	80.3	-9.6	-6.8	86.1	-18.1	-11.9
47	348.75	36.3	72.0	63.2	81.1	-4.1	-2.9	88.3	-21.2	-13.5
48	356.25	36.2	74.1	64.0	81.7	-9.0	-6.3	87.4	-18.4	-11.9
Average		36.3	72.6	63.4	78.7	-10.7	-7.8	90.6	-18.5	-11.6
Spread	(low)	35.0	70.1	61.8	73.5	-4.1	-2.9	73.5	-12.6	-7.9
	(high)	38.5	74.3	64.6	83.2	-16.4	-12.4	98.6	-22.1	-13.6

^a Clockwise from 000 when looking down at top of transducer, and clockwise from 0 on USRL polar patterns.

^b Phase angle $\theta = \tan^{-1} (X/R)$

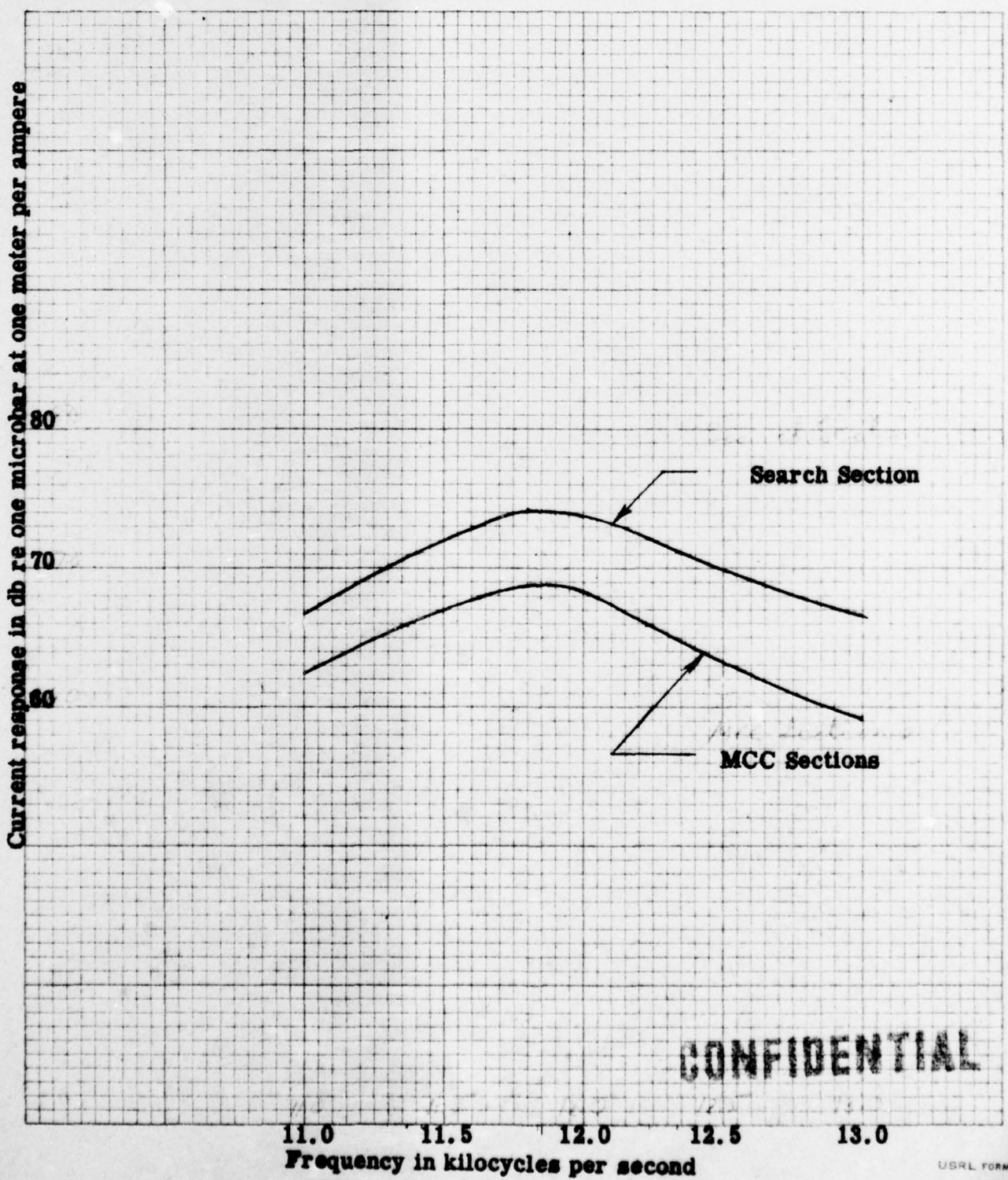
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USRL No. **19393**
Proj. No. **RP-1805C**
Date: **25 Sep 1957**

TRANSMITTING CURRENT RESPONSE
Sonar Transducer TR-117A/SQS-4, Mod 3 Serial X-2
All Staves Parallel



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Proj. No RP-1805C

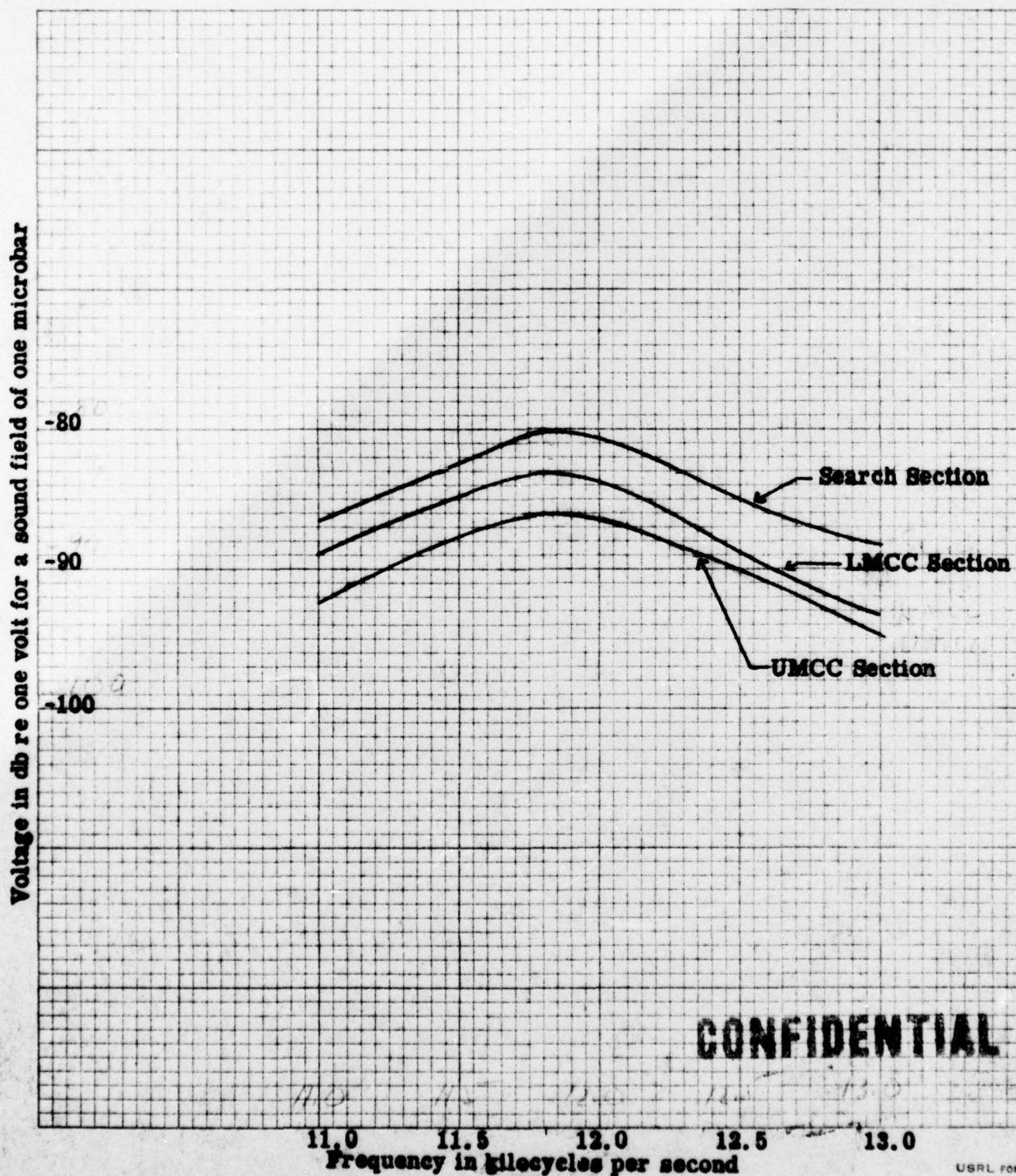
Date: 26 Sep 1957

FREE-FIELD VOLTAGE SENSITIVITY

Sonar Transducer TR-117A/SQS-4, Mod 3 Serial X-2

Open-circuit voltage

Average Sensitivity for Staves 45-48 and 1-4



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30°
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A

USRL NO. 19395

PROJECT NO. RP-1805C

DATE: 25 Sep 1957

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Search Section - All Staves Parallel
XY Plane

12.00 KC

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PROJECT NO. RP-18030

DATE: 25 Sep 1957

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SGS-4, Serial X-2
Search Section - All Staves Parallel
XY Plane

11.65 KC

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PROJECT MORP-1805C

DATE: 26 Sep 1957

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Search Section - All Staves Parallel
XY Plane

12.35 KC

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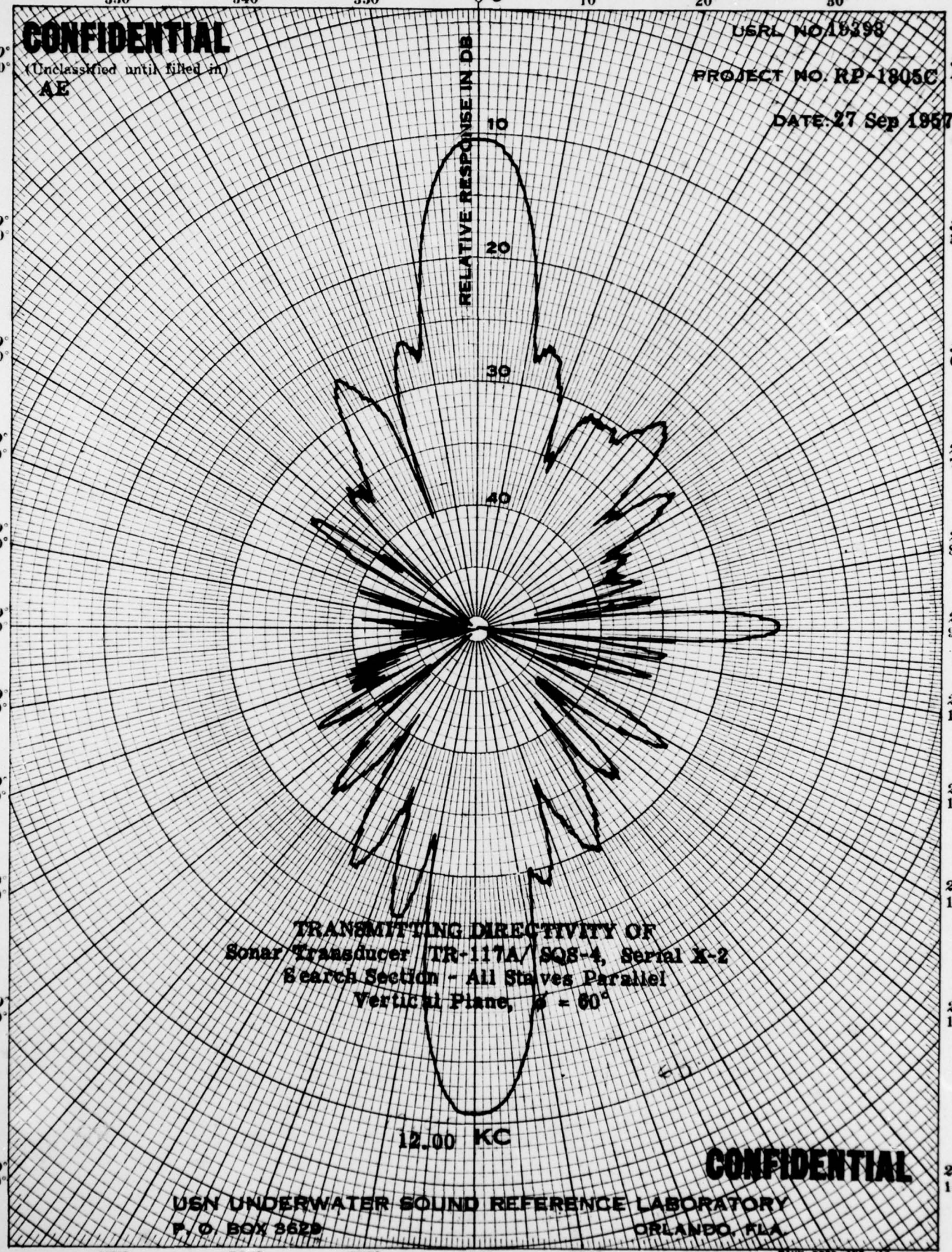
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PROJECT NO. RP-1805C

DATE: 27 Sep 1957

RELATIVE RESPONSE IN DB



TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Search Section - All Staves Parallel
Vertical Plane, $\theta = 60^\circ$

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PROJECT NO RP-1805C

DATE: 27 Sep 1957

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/ SQS-4, Serial X-2
Search Section - All Staves Parallel
Vertical Plane, $\phi = 60^\circ$

11.65 KC

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USRL NO 19400

PROJECT NO. RP-1805C

DATE 27 Sep 1967

RELATIVE RESPONSE IN DB

TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Search Section - All Staves Parallel
Vertical Plane, $\phi = 60^\circ$

12.35 KC

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PROJECT NO. RP-1805C

DATE: 25 Sep 1957

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonar Transducer TH-117A/SQS-4, Serial X-2
Upper MCC Section - All Staves Parallel
Conical pattern with receiver 20° below XY plane

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USRL NO 19402

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DATE 25 Sep 1957

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Upper MCC Section - All Staves Parallel
Conical pattern with receiver 20° below XY plane

11.05 KC

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USRL NO 19403

PROJECT NO. RP-1805C

DATE: 25 Sep 1957

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Upper MCC Section - All Staves Parallel
Conical pattern with receiver 20° below XY plane

12.35KC

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DATE 27 Sep 1957

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Upper MCC Section - All Staves Parallel
Vertical Plane, $\phi = 60^\circ$

12.00KC

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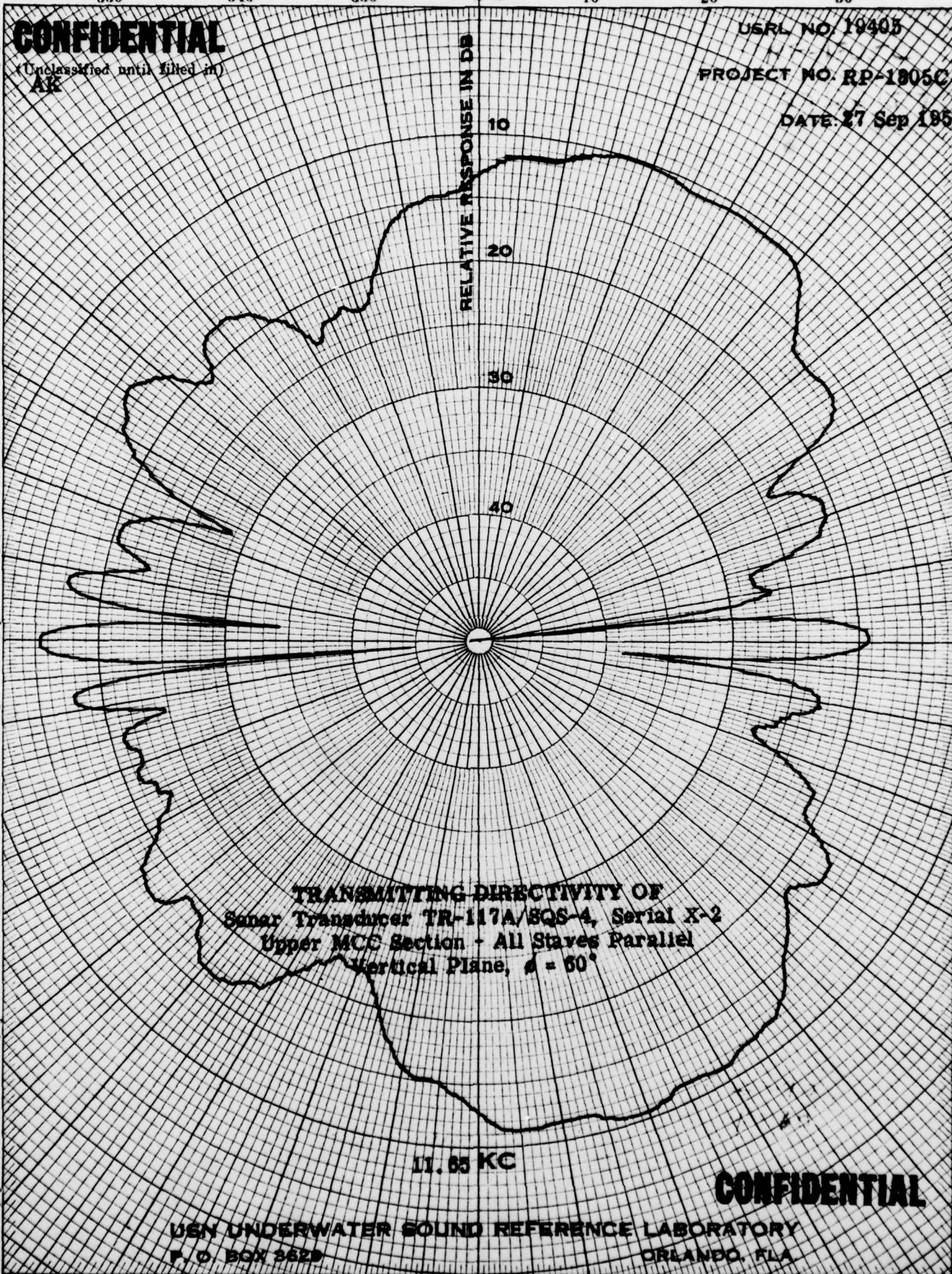
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PROJECT NO. RP-1805C

DATE 27 Sep 1957

RELATIVE RESPONSE IN DB



TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Upper MCC Section - All Staves Parallel
Vertical Plane, $\theta = 60^\circ$

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DATE: 27 Sep 1957

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonic Transducer TR-117A/SQS-4, Serial X-2
Upper MCC Section - All Staves Parallel
Vertical Plane, $\theta = 90^\circ$

12.35 KC

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USRL NO 19487

PROJECT NO RP-1805C

DATE: 25 Sep 1967

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Lower MCC Section - All Staves Parallel
Conical pattern with receiver 20° below XY plane

12.00 KC

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PROJECT NO RP-1805C

DATE 25 Sep 1957

RELATIVE RESPONSE IN DB

TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Lower MCC Section - All Slaves Parallel
Conical pattern with receiver 20° below XY plane

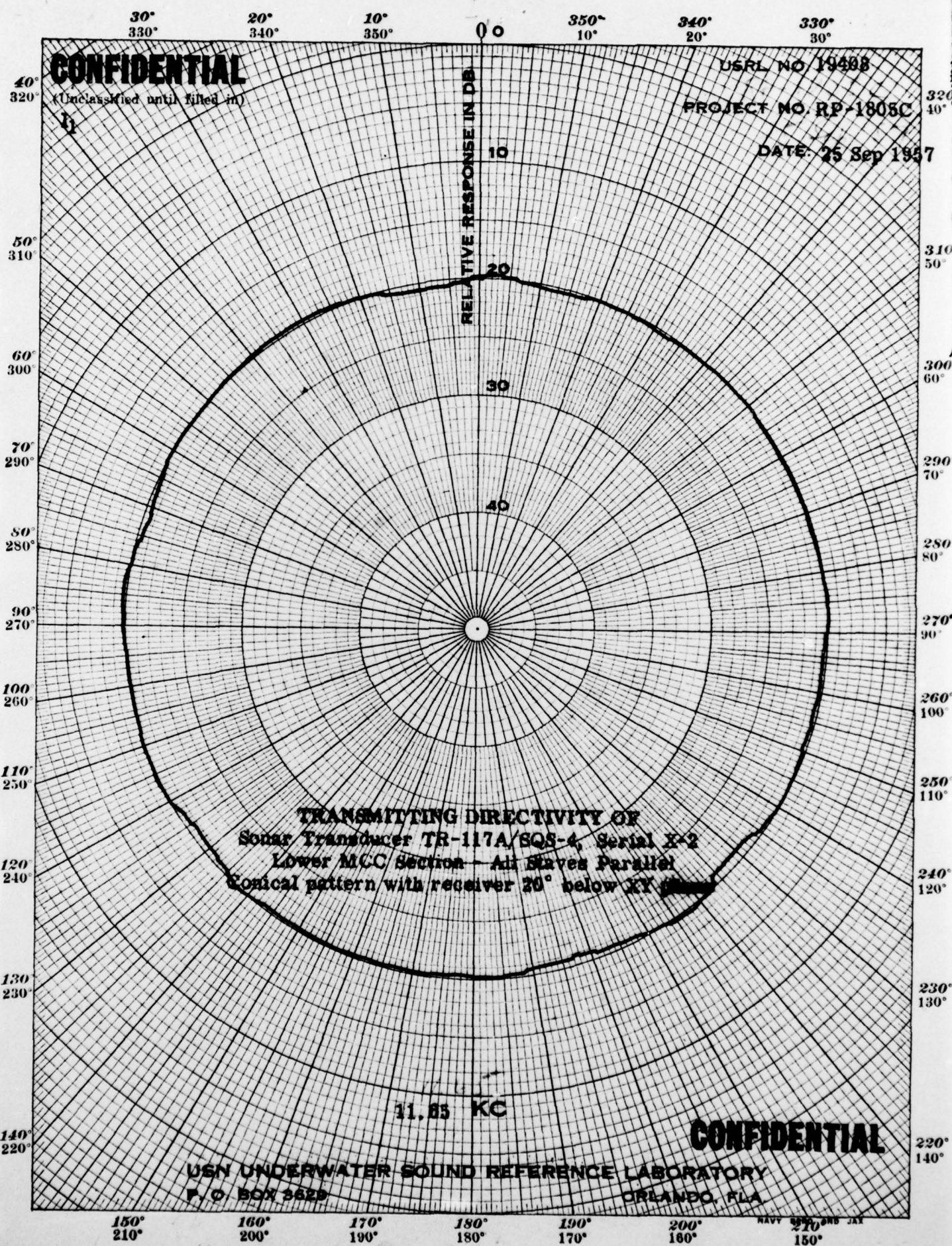
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USRL NO 19408

PROJECT NO RP-1805C

DATE 25 Sep 1957

RELATIVE RESPONSE IN DB

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TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, Serial X-2
Lower MCC Section - All Staves Parallel
Conical pattern with receiver 20° below XY plane

12.35 KC

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Director USN-USRL,
P. O. Box 3629
Orlando, Florida
And Refer To:

Code 120
RP-1805
Ser T007-58
7 January 1958

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REGISTERED MAIL

CONFIDENTIAL (Unclassified when enclosure is removed)

From: Director, USN Underwater Sound Reference Laboratory, Orlando, Fla.
To: Chief, Bureau of Ships (Code 848), Department of the Navy,
Washington 25, D. C.

Subj: Sonar, contract NObsr-71072, scanning sonar transducer TR-117A/
SQS-4 Mod 3 serial X-2; calibration of

Ref: (a) USRL ltr RP-1805 serial T308-57 of 11 Oct 1957

Encl: (1) Drawings USRL 19885, 19886, 19887 (1 print of each)

1. It has just been discovered that three directivity patterns were unintentionally omitted from USRL Calibration Report No. 1465, which was concerned with the subject equipment and was forwarded by reference (a). These drawings are forwarded as enclosure (1). They should be inserted in USRL Calibration Report No. 1465 to follow drawing 19409.

JOHN M. TAYLOR, Jr.
By direction

Copy to:

Harris Transd Corp (1) (with encl)
Gen Elec Co, Syracuse (Greenhalgh) (1)(with encl)
INSMAT Bridgeport (without encl)
INSMAT Syracuse (without encl)

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1091024-58

30°
330°

20°
340°

10°
350°

0°

350°
10°

340°
20°

330°
30°

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AM

USRL NO 19885

PROJECT NO. RP-1805C

DATE: Sep 1957

RELATIVE RESPONSE IN DB

10

20

30

40

TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A, SQS-4, serial X-2
Lower MCC Section - All Staves Parallel
Vertical Plane, $\phi = 60^\circ$

12.00 KC

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P. O. BOX 3629 ORLANDO, FLA

150°
210°

160°
200°

170°
190°

180°

190°
170°

200°
160°

NAVY BND JAT
210°
150°

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AL

USRL NO 19886

PROJECT NO RP-1805C

DATE: 27 Sep 1957

RELATIVE RESPONSE IN DB

40° 320°
50° 310°
60° 300°
70° 290°
80° 280°
90° 270°
100° 260°
110° 250°
120° 240°
130° 230°
140° 220°

320° 40°
310° 50°
300° 60°
290° 70°
280° 80°
270° 90°
260° 100°
250° 110°
240° 120°
230° 130°
220° 140°

TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, serial X-2
Lower MCC Section - All Staves Parallel
Vertical Plane, $\phi = 80^\circ$

11.65 KC

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150° 210° 160° 200° 170° 190° 180° 180° 190° 170° 200° 160° 210° 150°

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AN

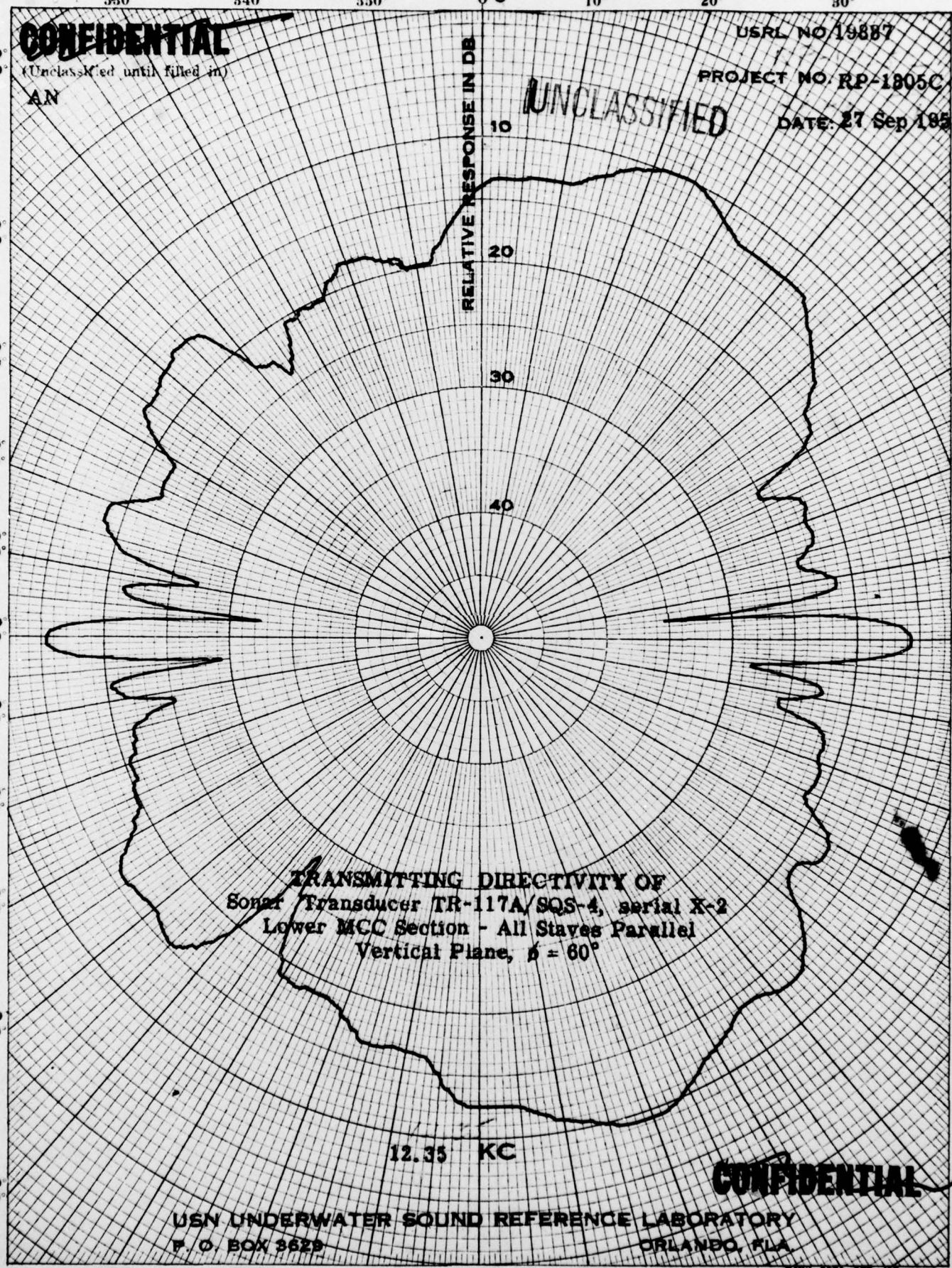
USRL NO 19887

PROJECT NO RP-1805C

DATE: 27 Sep 1957

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RELATIVE RESPONSE IN DB



TRANSMITTING DIRECTIVITY OF
Sonar Transducer TR-117A/SQS-4, serial X-2
Lower MCC Section - All Staves Parallel
Vertical Plane, $\phi = 60^\circ$

12.35 KC

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